Release A CDR RID Report

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Originator Lynnes, Chris

Organization GSFC DAAC

E Mail Address lynnes@daac.gsfc.nasa.gov

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Phone No (301)286-2260

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Section RMA   **Page**   **Figure Table**

Category Name ECS System-Level   **Actionee** ECS

Sub Category

Subject RMA is Interpreted Too Coarsely

Description of Problem or Suggestion:

RMA analysis has led to a heavily redundant system, with nearly every hardware item having a redundant backup, and nearly every disk being part of a RAID array. This results in significant increase in cost with marginal benefits (a couple percent or less added availability) to science users. At the same time, other parts of the system are undersized (especially disk space) due to cost constraints and optimistic interpretations of sizing requirements.

These costs could be significantly reduced, or reallocated to more useful areas, by decomposing Level 3 RMA (especially Ao) functional requirements, and allocating varying RMA to the decomposed areas. The best example of this is DIPHW which uses RAID disk, presumably for RMA as the peripherals (8mm, 4mm, 6250) have slower throughput than regular disks. The RMA is presumably driven by EOSD3920 (Ao of archive/distribution of 0.98) and/or EOSD3900 (Ao of receiving data=0.999). While these make sense for receiving and distributing time-critical data to data producers electronically, they do not make much sense for media creation (or reading), which is intrinsically a semi-manual, asynchronous process.

At the same time, the disk size for DIPHW appears undersized for a 1x distribution, allowing no contingency for temporal variation in requests or reduction in effective capacity by software errors.

Originator's Recommendation

Decompose RMA requirements based on the need of the particular customers and/or functions. Use this decomposition to reduce the proportion of RAID to regular disk and increase total disk space wherever possible within the ECS. (Or reallocate freed funds to other areas if Project so desires.) Apply the same decomposition to other RMA-driven hardware decisions such as standby machines.

GSFC Response by: **GSFC Response Date**

HAIS Response by: Gary Roth / Bang Nguyen   **HAIS Schedule** 9/20/95

HAIS R. E. Mary Armstrong   **HAIS Response Date** 11/29/95

Availability is not the only factor which drives the decision to use redundant hardware. ECS Level 3 operational requirement, No.EOSD0510: "ECS shall be capable of being tested during all phases of its development and flight operations", is one of the key architecture drivers which requires concurrent operations and test in all the ECS subsystems. The Mean Down Time (MDT) is a significant, if not primary factor, when relatively high failure rate equipment becomes a single point of failure due to lack of redundancy (as well as a maintenance and support issue). Processing requirements also drive the architecture, EOSD4020: "At each DAAC site, the product generation functional capabilities shall be spread across multiple product generation computers thereby providing a 'failsoft' environment", which requires more than one product generation computer. Operationally a second computer is needed for processing so as not to get too far behind with processing and to assist in eliminating the processing backlog once the primary computer is repaired.

RAID is used in most instances mainly because non-RAID disks with the same capabilities have higher failure rates and to assure data integrity during and after a failure. The use of RAID in the DIPHW not only improves availability but assures the integrity of the data and provides a suitable collection/queuing area for the data products awaiting transfer to hard media during times of unstaffed operation. This data could be replaced if lost but this would increase the data traffic on the LAN and would create a distribution backlog. The use of RAID disks is a logical choice since they have high reliability with redundant hot swappable disks, controllers and power supplies. When using RAID-5, the data itself is not lost upon failure and when a disk is replaced the unit automatically reconfigures itself to the level 5 RAID configuration keeping the data intact. Other avantages of using RAID versus disk drives are long term cost effectiveness due to lower sparing and maintenance costs, less disk management custom code development effort, and lower mean down time.

The contractual requirements for RMA are stated functionally and are Level 3 requirements. The availability analytical model has been created to guide the system hardware architecture and development. The system has been configured to assure compliance with these requirements at minimum costs. The level 3 requirements have been restated as level 4 requirements. Our availability modeling is only based on functional strings, and does not force a particular component to meet RMA requirements. It is not feasible to force a COTS vendor to meet a specific RMA requirement allocation but we can effectively rearchitect our system using vendor supplied RMA data to meet the level 3 contractual RMA functional requirements.

To eliminate RAID as suggested would not be prudent since doing so would increase the MDT (the requirement is 2.0 hours or

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To eliminate RAID as suggested would not be prudent since doing so would increase the MDT (the requirement is 2.0 hours or less per EOSD3920) and adversely impact processing and operational requirements. The predicted Availability and MDT for the RMA functional requirements are being compared against end-of-contract RMA requirements. The requirements will not change over the life of the contract but additional hardware will be used in each RMA functional string, for each successive release, thereby decreasing the now perceived gap between predicted availability and MDT and the contractual RMA requirements.

Status   **Closed**   **Date Closed**   **12/7/95**   **Sponsor**   **Schroeder**

****** **Attachment if any** ******